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(54) POLYESTER FILM FOR RELEASING POLARIZING PLATE

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a film for releasing a polarizing plate which has excellent transparency, adhesion to silicone and workability and also which has a small orientation angle, few optical foreign matters and scratch resistance.

SOLUTION: The co-extruded polyester film for releasing the polarizing plate consists of at least two or more layers and is provided with $\leq 4\%$ haze value, $\leq 10^\circ$ orientation angle and ≤ 5 pieces per 0.3 m² of fly specks with $\geq 90 \mu\text{m}$ major axes.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the polyester film for ***** forms excellent in transparency, slipping nature, rolling-up nature, and inspectability in more detail about the polyester film for ***** forms.

[0002]

[Description of the Prior Art] In recent years, a liquid crystal display is spreading through displays, such as a cellular phone, a portable game machine, television for mount, an electrical machinery and apparatus, and a personal computer, quickly, and the need of a cellular phone, or a note type and a space-saving desktop PC is increasing especially. In connection with it, the increase of need and big-screen-izing of a liquid crystal display are advancing. In the liquid crystal display, the polarization film is stuck so that both sides of the liquid crystal film and a polarization shaft may cross at right angles mutually. The ** form film is stuck on one side of the polarization film until it sticks.

[0003]

[Problem(s) to be Solved by the Invention] Although a silicone layer is painted in order to acquire that a ** form film is a protection film of surface crack prevention of the polarization film, and it is transparency in order to inspect the polarization film although it has exfoliated in the final product and is not used for it, that an orientation angle is small, that there are few milling cutter pecks (optical foreign matter), and mold releasability, it is required that it is silicone *****, that processing workability should be good, etc. However, the actual condition is that the ***** form film with which are satisfied of all is not found.

[0004] This invention cancels the technical problem of this conventional technique, and makes it a technical problem to offer the film for ***** forms which is simultaneously satisfied with transparency that there are few that an orientation angle is small, silicone *****, and milling cutter pecks (optical foreign matter), that processing workability is good, and that it is hard to attach a blemish.

[0005]

[Means for Solving the Problem] this invention persons came to complete a header and this invention for the ***** form film with which are satisfied of demand characteristics being obtained by realizing high transparence, a low foreign matter, and a low orientation angle using the polyester film which is mainly concerned with the polyethylene terephthalate with which the contents of a lubricant particle differ, and which consists of two-layer at least, holding processing workability, as a result of repeating examination wholeheartedly that the above-mentioned technical problem should be solved.

[0006] That is, the polyester film for ***** forms of this invention is a co-extrusion film which consists of more than two-layer at least, and an orientation angle is characterized by a milling cutter peck with a major axis of 90 micrometers or more being five or less per two 0.3m by the haze value of a film 10 or less degrees 4% or less. Moreover, center line surface roughness Ra is polyester film for ***** forms whose ten-point average of roughness height Rz are 20nm or more 60nm or less, and is

500nm or more preferably. Moreover, the thickness of a film is 15-micrometer or more polyester film for ***** forms which is 75 micrometers or less preferably. Moreover, it is polyester film for ***** forms which contains preferably at least two or more sorts of lubricant particles from which mean particle diameter differs. Moreover, it is polyester film for ***** forms which has the spreading layer of easy adhesiveness to silicone preferably.

[0007] The polyester which constitutes the film of <polyester> this invention is a main copolymerization object repeatedly made into a unit about polyethylene terephthalate or ethylene terephthalate.

Polyethylene terephthalate fits the film for ***** forms by high transparence as a homopolymer, and the points that especially a mechanical strength is large are the features.

[0008] In this invention, a dicarboxylic acid component or a diol component is sufficient as the copolymerization component in the case of copolymerized polyester. As this dicarboxylic acid component, the alicycle group dicarboxylic acid like **** aliphatic series dicarboxylic acid, such as **** aromatic series dicarboxylic acid, such as isophthalic acid and naphthalene dicarboxylic acid, an adipic acid, an azelaic acid, a sebacic acid, and Deccan dicarboxylic acid, and cyclohexane dicarboxylic acid etc. can be illustrated, and **** aliphatic series diols, such as 1,4-butanediol, 1,6-hexanediol, and a diethylene glycol, 1, the alicycle group diol like 4-cyclohexane dimethanol, and the aromatic series diol like bisphenol A can be illustrated as a diol component. These can use independent or two sorts or more. Especially in these, both transparency and tear strength of isophthalic acid are desirable highly.

[0009] Although the rate of a copolymerization component is based also on the class, it is a rate that the polymer melting point becomes the range of 245 degrees C - 258 degrees C (melting point of a homopolymer), as a result. The melting point will be inferior in thermal resistance at less than 245 degrees C. Moreover, the rate of a heat shrink is large and the smoothness of a film falls. Here, melting point measurement of polyester is Du. Pont Instruments 910 It is based on the approach of searching for a fusion peak by part for programming-rate/of 20 degrees C, using DSC. In addition, the amount of samples is set to about 20mg.

[0010] the intrinsic viscosity (alt.chlorophenol, 35 degrees C) of polyethylene terephthalate or copolymerized polyester is 0.52-1.50 -- desirable -- further -- desirable -- 0.57-1.00 -- it is 0.60-0.80 especially preferably. When this intrinsic viscosity is less than 0.52, tear strength may be insufficient and it is not desirable. On the other hand, when intrinsic viscosity exceeds 1.50, the productivity in a raw material production process and a film production process is spoiled.

[0011] Although not limited by the process, in the case of a terephthalic acid, ethylene glycol, and copolymerized polyester, the esterification reaction of the copolymerization component is added and carried out further, and the polyethylene terephthalate or copolymerized polyester in this invention has the approach of making carry out a polycondensation reaction and using as polyethylene terephthalate or copolymerization polyethylene terephthalate until it becomes a degree of polymerization aiming at the resultant subsequently acquired. Or in the case of copolymerized polyester, the approach of making carry out a polycondensation reaction and using as polyethylene terephthalate or copolymerization polyethylene terephthalate until it becomes a degree of polymerization aiming at the resultant which adds dimethyl terephthalate ester and ethylene glycol further, was made to carry out the ester exchange reaction of the copolymerization component, and was subsequently acquired can be mentioned preferably. Moreover, the polyethylene terephthalate or copolymerization polyethylene terephthalate obtained by the above-mentioned approach (melting polymerization) can be made into a polymer with still higher polymerization degree with the polymerization method (solid state polymerization) in a solid phase condition if needed.

[0012] Additives, such as an antioxidant, a thermostabilizer, a viscosity controlling agent, a plasticizer, a hue amelioration agent, lubricant, and a nucleating additive, can be added to said copolymerized polyester if needed. Moreover, as a catalyst used for said polycondensation reaction, a titanium compound (Ti compound), a germanium compound (germanium compound), etc. are mentioned preferably.

[0013] It is important for the polyester film for ***** forms of <addition particle> this invention to add a lubricant particle and to secure the workability (slipping nature) of a film, and in order to also

maintain transparency, it is desirable to adjust the mean particle diameter and the addition of a lubricant particle of each class to the optimal range. Although the thing of arbitration can be chosen as a lubricant particle, as inorganic system lubricant, a silica, an alumina, a titanium dioxide, a calcium carbonate, a barium sulfate, etc. can be illustrated, and a spherical silicone resin particle, a bridge formation polystyrene particle, etc. can be illustrated as organic system lubricant.

[0014] The film of this invention is a co-extrusion film which consists of more than two-layer at least, as a thing of the diameter of a large drop, the range of the side to which the mean particle diameter of the lubricant particle added on each class touches the polarization film is 1000-2000nm still more preferably, and the range of 1000-2500nm of 1000-3000nm of 50-800nm of things of the diameter of a granule is 100-700nm still more preferably preferably. If a large drop radial ball child's mean particle diameter exceeds 3000nm, the peel strength of the silicone layer and polarization film surface which were painted on this field will become light too much, natural exfoliation will occur, and practicability will fall. Moreover, when it winds around a roll, a projection may imprint and it may become the fault of a field. The peel strength of the silicone layer and polarization film surface which were painted on this field becomes heavy too much, exfoliation workability falls, and, in the case of mean particle diameter [less than 1000nm], a fault like exfoliation marks is produced on the front face of the polarization film. If a granule radial ball child's mean particle diameter exceeds 800nm, it will be hard to discover abrasion-proof nature. On the other hand, in less than 50nm, in order to obtain abrasion-proof nature, an addition must be made [many], and the haze value of a film exceeds 4%. A two-layer case and in the case of three (3 or more [or]) layers, it differs at an outside surface side. In the case of three (3 or more [or]) layers, it is the same as that of the layer which touches a polarization film surface, and a profile. However, since coating is not carried out, the minimum of a large drop radial ball child's mean particle diameter is 500nm. In this case, since an interlayer's lubricant particle does not contribute to workability but transparency is reduced, it is so good that it is few. However, it is desirable not to consider as 0% in consideration of reuse for a stripping section. As for the content of an interlayer's lubricant particle, it is desirable that they are 70% or less of the content of the layer which touches the polarization film, and 50 more% or less. If a content exceeds 70%, since transparency will fall and a fault will be hidden on the occasion of fault inspection of a polarizing plate, it is not desirable. In order to give workability also at an outside surface side in a two-layer case, as for the content of a lubricant particle, it is desirable that they are 70% or less of the content of the layer which touches the polarization film, and 20% or more. At less than 20%, slipping nature is bad and workability is bad.

[0015] Moreover, in order to reduce the number of a big and rough particle or a milling cutter peck, filtering a melting polymer is preferably recommended using a 15-25-micrometer nonwoven fabric mold filter 10-30 micrometers of average openings which consist of a stainless steel thin line of 15 micrometers or less of wire sizes as a filter at the time of film production. By this approach, a milling cutter peck with a big and rough particle of with a particle size of 20 micrometers or more and a major axis of 90 micrometers or more is mostly removable.

[0016] Although it does not specify, the construction material of a lubricant particle has sharp particle size distribution, and since five or more particles are small, deformation of a particle is desirable [construction material / as a particle with a mean particle diameter of 200-3000nm, spherical silicone resin and a spherical silica are desirable, and / Mohs hardness / the particles]. As a 50-800nm particle, an alumina, a silica, titanium oxide, zirconias, and these multiple oxides are desirable, and may use two or more sorts together.

[0017] A lubricant particle is added in the system of reaction at the stage of the arbitration in the case of being based on the stage or direct polymerization method of the arbitration under an ester exchange reaction thru/or polycondensation reaction, when usually based, the reaction time, for example, the ester interchange method, for manufacturing polyester, (as a slurry which is among a glycol preferably). It is desirable to add a particle in the system of reaction at a period until it results in about 0.3 in early stages of a polycondensation reaction (for example, intrinsic viscosity) especially.

[0018] As for the thickness of the film of <film thickness> this invention, it is desirable that they are 15 micrometers or more and 75 micrometers or less. Furthermore, it is desirable that 70 micrometers or less

are [20 micrometer or more] within the limits of 25 micrometers or more 65 micrometers especially. Since a haze value may exceed 4%, inspection precision will fall upwards and it will become cost high if it exceeds 75 micrometers, it is not desirable. Reinforcement and the so-called waist run short and it is hard coming to remove by the thickness of less than 15 micrometers at the time of a ** form.

[0019] the side to which the thickness of each class touches the polarization film -- overall thickness Mino -- it is 30% or less 5% or more 40% or less 4% or more 50% or less 3% or more still more. preferably preferably. a two-layer case -- other layers -- overall thickness Mino -- it is 95% or less 70% or more 96% or less 60% or more 97% or less 50% or more still more preferably preferably. If the side which touches the polarization film, i.e., a split face, exceeds 50%, a haze value may exceed 4%, the rolling-up nature of a film will be bad in it being less than 3%, and the product yield will become low. In the case of three (above) layers, 3 - 20% of overall thickness Mino of the thickness of the surface of the reverse side of the side which touches the polarization film is desirable. At less than 3%, if effectiveness is small and exceeds 20%, a haze value will tend to become large.

[0020] A milling cutter peck with a major axis of 90 micrometers or more which exists in the polyester film of <milling cutter peck> this invention requires that they are five or less pieces into 0.3m². It is so good that there is a milling cutter peck with a major axis of 90 micrometers or more since they bar rectilinear propagation of light and causes [of an image] distortion. [few] Since a milling cutter peck produces a foreign matter, a non-melting polymer, and a big and rough particle in a nucleus, it is desirable to remove a big and rough particle and a foreign matter by the activity of the above-mentioned nonwoven fabric mold filter. Furthermore, it is desirable to use the lubricant particle in which many do not contain the cause object of a milling cutter peck.

[0021] The orientation angle of the film of <orientation angle> this invention is 10 or less degrees. If an orientation angle exceeds 10 degrees, it will face inspecting the polarization film, and a visual field becomes dark, and the detection precision of a foreign matter falls. In order for an orientation angle to obtain the film of 10 or less degrees, it is desirable to use about 20% of center sections of the film production machine width. The remaining part is used for other applications. In addition, orientation angles are the width-of-face (width) direction of the orientation main shaft by drawing, and an angle to make here. In the center section of the cross direction at the time of film production, the usual polyester film by every direction serial drawing is weak horizontal orientation or equal orientation, and makes this orientation angle 0 times.

[0022] When supplying with the gestalt of a sheet film is possible, and only the include angle equivalent to an orientation angle leans and pierces the direction of one side of a punching machine from a longitudinal direction, although an edge article can also be used, a loss increases as an edge.

[0023] When it has equipment whose heat treatment grasps the ends of a full film with a grasping implement, makes almost equal inlet-port width of face and outlet width of face, and is possible, by the heat treatment process stated by the producing-film method, processing temperature is made lower, movement magnitude of a center section is made into usual one half extent, and a film is produced. Movement magnitude is calculated in the amount at which the straight line after drawing a straight line in the direction of width (width of face) with a carpenter's inking string etc. and coming out of a tenter to the film before going into a tenter turns in the shape of radii. It lets it pass to the equipment which is the heat setting machine which has a grasping implement for this film, and can make almost equal inlet-port width of face and outlet width of face, and heat-treats at 200-245 degrees C. At this time, it is important at the time of film production and this heat treatment to process so that the transit direction may become reverse, and conditioning is carried out so that the line of the shape of said radii may return in the shape of a straight line mostly. By this processing, the anisotropy of both ends is corrected, covers full and can realize less than ten orientation angles. However, lowering of the yield by the reduction in productivity (a process increases) or abolition of a grasping implement part is not avoided, but there is also disadvantageous profit. It is the approach of restricting, when a facility response can be carried out, and adopting.

[0024] As for center line surface roughness Ra of the film of <surface roughness> this invention, it is desirable that it is [20nm or more] 60nm or less. There is an inclination which a film plane sticks

mutually as it is less than 20nm, and a volume figure and workability are bad and it is easy to attach a blemish to a front face. If it exceeds 60nm, transparency will fall and inspection nature will fall. As for the ten-point average surface roughness Rz, in a silicone spreading side, it is desirable that it is 500nm or more. A projection decreases dramatically that Rz is less than 500nm on the front face of a silicone spreading layer, and exfoliation with the polarization film becomes heavy. Although an upper limit cannot be specified, if Ra does not exceed 60nm, it is good. In order to obtain such surface roughness, it is based on addition of the above-mentioned lubricant particle.

[0025] It is desirable to make the paint film of silicone ***** form in the field which touches one side of the polyester film of <*****> this invention, i.e., the polarization film. In order that silicone may carry out the ** form of the film of this invention used for a polarization film surface protection from the polarization film, it applies, but since polyester film and silicone do not have the good adhesive property, they require processing of a certain *****. In this invention, it is desirable to form the following primer layer.

[0026] The silane coupling agent which constitutes a primer layer is a compound expressed with a general formula YRSiX_3 . Here, Y is [**** alkylene groups such as methylene, ethylene, and a propylene, and X of **** organic functional groups, such as a vinyl group, an epoxy group, an amino group, and a sulfhydryl group, and R] a **** hydrolysis radical and alkyl groups, such as a methoxy group and an ethoxy radical. As a concrete compound, vinyltriethoxysilane, vinyltrimethoxysilane, gamma-glycidoxypentyltrimethoxysilane, gamma-glycidoxypentylmethyldiethoxysilane, N-beta (aminoethyl)-gamma-aminopentyl trimethoxysilane, N-beta(aminoethyl)-gamma-aminopentyl methyl dimethoxysilane, gamma-mercapto pentyltrimethoxysilane, etc. can be mentioned, for example. As a desirable silane coupling agent, it is the coupling agent which has water solubility or water-dispersion.

[0027] As an alkaline inorganic particle which constitutes a primer layer with said silane coupling agent, although a ferrous-oxide sol, alumina sol, a tin-oxide sol, a zirconium dioxide sol, a silica sol, etc. can be mentioned, for example, especially alumina sol and a silica sol are desirable. The point which promotes the primary reaction nature (dimer-izing, trimer-izing, etc.) of a silane coupling agent above all to a silica sol is desirable.

[0028] An alkaline inorganic particle has the good thing of the diameter of a granule with large surface area, and that [its] 1-150nm of further 2-100nm of whose mean particle diameter is 3-50nm especially is desirable. If mean particle diameter becomes larger than 150nm, it is not desirable, in order that surface area may become small too much, and a reaction acceleration operation of a silane coupling agent may fall and the front face of a primer layer may carry out surface roughening. On the other hand, if mean particle diameter becomes smaller than 1nm, surface area is too large, and becomes [reaction control of a silane coupling agent] difficult and is not desirable.

[0029] As for the amount of an alkaline inorganic particle, it is desirable that they are 1 - 50 % of the weight and further 2 - 20 % of the weight to the amount of a silane coupling agent. If crosslinking reaction does not progress that this amount is less than 1 % of the weight but 50 % of the weight of another side is exceeded, precipitation occurs in coating liquid at the stability of coating liquid in a short time after addition of a chip, for example, a non-subtlety particle, and it is not desirable.

[0030] the primer coating liquid containing a silane coupling agent and an alkaline inorganic particle, especially aqueous coating liquid -- the pH -- 4.0-7.0 -- it adjusts to 5.0-6.7 preferably. Since the catalytic activity of a non-subtlety particle will be lost if this pH becomes less than 4.0, coating liquid will become unstable if another side 7.0 is exceeded, and precipitation arises, it is not desirable.

Although organic acids, such as inorganic acids, such as a hydrochloric acid, a nitric acid, and a sulfuric acid, oxalic acid, formic acid, a citric acid, and an acetic acid, are used as an acid which adjusts this pH, especially an organic acid is desirable.

[0031] Initial-complement addition can be carried out and surfactants, such as an anionic surface active agent, a cation mold surfactant, and the Nonion mold surface activity, can be used after this spreading, especially for aqueous liquid. As this surfactant, 0.5 or less N/m can descend the surface tension of coating liquid to 0.4 or less N/m preferably, and what promotes **** of polyester FIRUMUHE is desirable, for example, can mention polyoxyethylene alkyl phenyl ether, a polyoxyethylene-fatty-acid-

ester sorbitan fatty acid ester, a glycerine fatty acid ester, fatty-acid metallic soap, alkyl sulfate, an alkyl sulfonate, alkyl sulfo succinate, the 4th class ammoniumchloride salt, an alkylamine hydrochloric acid, etc. Furthermore, other additives, such as an antistatic agent, an ultraviolet ray absorbent, a pigment, an organic filler, lubricant, and an antiblocking agent, are [in / the range which does not vanish the effectiveness of this invention] mixable.

[0032] This primer coating liquid can be applied to one side of polyester film, and, subsequently a bridge formation primer layer can be prepared by desiccation and carrying out heat bridge formation. Spreading may be performed at the process which separates from the production process of this film at the usual primer spreading process, i.e., the polyester film which carried out biaxial-stretching heat setting, and is applied to it. However, since it is easy to involve in **, dust, etc. at this process, the coating in a clean ambient atmosphere is desirable. The coating in a polyester film production process is more desirable than this viewpoint. Especially, it is desirable to apply to one side of polyester film before it is in process and crystal orientation is completed of this, or both sides as aquosity coating liquid.

[0033] Here, thermofusion of the polyester is carried out to polyester film before crystal orientation is completed, and the uniaxial stretched film to which either a lengthwise direction (longitudinal direction) or a longitudinal direction (cross direction) carries out orientation of the shape of a film, and the made unstretched film and an unstretched film, the thing (biaxially oriented film before making a lengthwise direction or a longitudinal direction re-extend eventually and making orientation crystallization complete) which carries out a low scale-factor stretch orientation in the two directions of a lengthwise direction and a longitudinal direction further are included as it is. It is desirable to apply to a lengthwise direction after uniaxial stretching in the usual process.

[0034] The solid content concentration of the above-mentioned coating liquid is usually 30 or less % of the weight, and its 10 or less % of the weight is still more desirable. 1-10g of coverage are desirable per [it is running / 0.5-20g] film one m2, and to a pan.

[0035] As the method of application, the coating method of well-known arbitration is applicable. for example, independent in the kiss coat method, the bar coat method, the die coat method, the reverse coat method, the offset gravure coat method, the MAIYA bar coat method, the gravure coat method, the roll brush method, a spray coating method, the Ayr knife coat method, the **** method, the curtain coat method, etc. -- or it is good to combine and apply.

[0036] It dries and the polyester film which applied coating liquid before carrying out crystal orientation completion is led to processes, such as a drawing and heat setting. for example, the vertical uniaxial-stretching polyester film which applied aquosity liquid is led to a stenter -- having -- a horizontal drawing -- and heat setting is carried out. In the meantime, heat bridge formation of the coating liquid is dried and carried out. This processing can be performed on the conditions accumulated in this industry from the former. As desirable conditions, desiccation conditions are 90-130 degree-Cx 2 - 10 seconds, for example, and if 90-130 degrees C and draw magnification are required a 3 to 5 times as many lengthwise direction as this, and a 3 to 5 times as many longitudinal direction as this, it is a 1 to 3 times as many re-lengthwise direction as this, and when carrying out heat setting of the drawing temperature, it is 180-240 degree-Cx 2 - 20 seconds. As for the thickness of the paint film after this processing, it is desirable that they are 20-1000nm and further 40-500nm.

[0037] The polyester film for ***** forms in <producing-film method> this invention can be fundamentally manufactured by the approach which is learned from the former or is accumulated in this industry. However, careful caution is important in order to satisfy the requirements for this invention. For example, a non-orientation laminated film can be manufactured first and it can obtain by subsequently carrying out biaxial orientation of this film. This non-orientation laminated film can be manufactured by the manufacturing method of the laminated film accumulated from the former. For example, the approach of carrying out the laminating of a polyester A horizon and the polyester B horizon (the need being accepted and it being C layer) which forms a reverse side in the melting condition or the condition that cooling solidification was carried out of polyester can be used. It can still more specifically manufacture by approaches, such as co-extrusion and an extrusion lamination. This

invention takes a co-extrusion method.

[0038] In consideration of thickness allocation of each class, the film by which the laminating was carried out by the above-mentioned approach can be extended in length and a longitudinal direction according to the manufacturing method of the biaxial oriented film further accumulated from the former, and can be used as a biaxial oriented film. For example, do melting and co-extrusion of polyester at the melting point (T_m :degree C) thru/or (T_m+70) the temperature of **, and a non-extended laminated film is obtained. This non-extended laminated film to 1 shaft orientations (a lengthwise direction or longitudinal direction) The temperature of $-(T_g-10)$ (T_g+70) **. It is desirable to extend for the scale factor of 3 times or more preferably 2.5 or more times with (however, the glass transition temperature of T_g :polyester), and to extend for the scale factor of 3 times or more preferably 2.5 or more times with the temperature of $T_g - (T_g+70)$ ** subsequently to the above-mentioned drawing direction and the direction of a right angle. Furthermore, you may extend again in a lengthwise direction and/or a longitudinal direction if needed. Thus, all draw magnification has 9 or more desirable times as area draw magnification, its 12 to 35 times are still more desirable, and especially its 15 to 30 times are desirable.

[0039] As for a biaxial oriented film, it is desirable to be able to carry out heat setting at the temperature of ** (T_g+70) - (T_m-10) **, for example, to carry out heat setting at 180-235 degrees C, when it is polyethylene terephthalate further again. When the rate of a heat shrink becomes a problem in the time of lamination with the polarization film etc., if heat setting temperature is made into 225-235 degrees C and it is satisfactory, it considers as 180-210 degrees C, and the range of ten or less orientation angles is [way] wide, and it is desirable. Heat setting time amount has 1 - 60 desirable seconds.

[0040] It is desirable to apply a water-dispersion ointment to one side (side which touches the polarization film) of a film, and to make a 5-200nm coat form in a film after desiccation of silicone ***** after the above-mentioned in process one, for example, a vertical drawing. Although a coating method is not limited, the coating by the reverse roll coater is desirable. Other conditions are as the preceding clause having described.

[0041] In addition, various physical-properties values and properties in this invention can be measured and evaluated as the following.

[0042] (1) Use the haze measuring instrument (NDH-20) by haze value Nippon Denshoku Industries, and it is JIS about the haze value of a film. It measures based on P-8116. A valuation basis is as following.

O 4% [or less of :haze values] x : 4% ** of haze values.

[0043] (2) Change into the condition of dark field in the condition that there is no sample, using an orientation angle polarization microscope. The polarization shaft orientation of an analyzer and the longitudinal direction of a sample are doubled, and a sample is inserted. It continues being dark field as an orientation angle is 0 times, and a visual field becomes bright when it is others. A sample is rotated and it considers as dark field. An angle of rotation is an orientation angle of a sample. A valuation basis is as following.

O : -- an orientation angle -- less than [10 degrees] x: -- an orientation angle -- 10-degree **.

[0044] (3) Place and observe a sample on the milling cutter peck surface light source, a rectangular polarizing plate, and the polarizing plate of equipment with a magnifier. When a sample is rotated and it is made dark field, a milling cutter peck looks bright. It expresses with the number with a major axis [per two] of 90 micrometers or more a sample area of 0.3m. A valuation basis is as following.

O : -- the number of a milling cutter peck with a major axis of 90 micrometers or more -- less than [0.3m5 per two] x: -- the number of a milling cutter peck with a major axis of 90 micrometers or more - - 0.3m -- six or more per two

[0045] (4) Surface roughness a. Center line surface roughness (R_a)

Front flesh-side both sides of a film are measured with a surface roughness plan (Tokyo Seimitsu Co., Ltd. surfboard COM 111A), respectively, the average is computed, and it considers as the surface roughness of each front face.

b. Ten-point average of roughness height (R_z)

Five points (H_v1 , H_v2 , H_v3 , H_v4 , H_v5) are taken from the one where the higher one of a peak to five

points (Hp1, Hp2, Hp3, Hp4, Hp5) and a trough are lower, and the average of roughness height is set to Rz. namely, -- $Rz = [(Hp1 + Hp2 + Hp3 + Hp4 + Hp5) - (Hv1 + Hv2 + Hv3 + Hv4 + Hv5)]/5$ It can ask.

[0046] (5) Mean-particle-diameter a. of a particle When a particle is a primary particle, it is CP[by Shimadzu Corp.]-50 mold cent RIFUYUGURU. It measures using a particle size analyzer (Centrifugal Particle Analyzer). The particle size equivalent to 50 mass percent is read in the cumulative curve of the particle and ullage of each particle size computed based on the obtained **** settling curve, and let this value be the above-mentioned mean particle diameter ("particle-size-analysis technical" Nikkan Kogyo Shimbun issuance, 1975, a page 242 - 247 reference).

b. When the inactive particle as lubricant added when a particle was floc is a secondary particle by condensation of a primary particle, since the particle size obtained by mean-particle-diameter measurement by the above-mentioned approach may become smaller than actual mean particle diameter, the following approach is used for it. First, the film containing a particle is used as an ultrathin section with a thickness of 100nm in the direction of a cross section, a particle is observed for an about 10,000-time scale factor using a transmission electron microscope (for example, JEOL JEM- 1200 EX), and floc (secondary particle) is observed. Let the particle diameter which measured and carried out the number average of the diameter of a circular side product of each particle about 1000 particles using image-analysis equipment etc. be secondary [an average of] particle size using this photograph. In addition, identification of a particle kind can be performed using the quantitative analysis of the metallic element by SEM-XMA and ICP etc. Primary [an average of] particle size photos the scale factor of a transmission electron microscope in 100,000 to 1 million times, and also is measured according to the approach of secondary [an average of] particle-size particle-size measurement.

[0047] (6) Measure 100 points by the micrometer with the outside of film thickness, and consider as the thickness of a film in quest of the average.

[0048] (7) Melting point Du Pont Instruments 910 It was based on the approach of searching for a fusion peak by part for programming-rate/of 20 degrees C, using DSC. In addition, the amount of samples is set to about 20mg.

[0049]

[Example 1] Dimethyl terephthalate and ethylene glycol as ester interchange **** manganese acetate It considers as a polymerization catalyst and a polymer is further received [phosphorous acid] in a spherical silicone particle with a mean particle diameter of 1200nm as lubricant considering a germanium dioxide as a stabilizer. 0.005 % of the weight, A polymer is received in a spherical calcium carbonate with a mean particle diameter of 600nm. 0.2 % of the weight, The alumina with a mean particle diameter of 400nm was added so that it might become 0.1% of the weight to a polymer, the polymerization was carried out with the conventional method, and the polyethylene terephthalate of intrinsic viscosity (orthochromatic chlorophenol, 35 degrees C) 0.65 was obtained. The pellet of this polyethylene terephthalate was supplied to the extruder after 3-hour desiccation at 170 degrees C, and it fused with the melting temperature of 295 degrees C, filtered with the nonwoven fabric mold filter of 24 micrometers of average openings which consists of a stainless steel thin line of 13 micrometers of wire sizes, and extruded from both the surfaces of the three layer die of T forms. The amount of a lubricant particle was diluted with the polymer of non-lubricant to another extruder, the polymer made into the addition shown in a table 1 was supplied to it, and it extruded from the interlayer of the three layer die of the above-mentioned T forms on the above and these conditions to it. This three-layer melt was extruded to revolution cooling drum lifting with an about [surface-finish 0.3s] and a skin temperature of 20 degrees C, and the total thickness of 534 micrometers and a class thickness 70/394/70micrometer unstretched film were obtained.

[0050] Thus, the obtained unstretched film was preheated at 75 degrees C, it heated at one infrared heater with a skin temperature of 800 degrees C from 15mm upper part between the low-speed roller and the high-speed roller, and extended 3.6 times, and it applied so that the coating liquid of the following component might be set to 40nm after a desiccation horizontal drawing as a silicone ***** ointment at one side of the film after vertical drawing termination. The coating liquid used here is aqueosity coating liquid adjusted to pH6.3 by the citric acid including the silane coupling agent (gamma-

glycide propyltrimethoxysilane) 83 weight section, the non-subtlety particle (mean-particle-diameter [of 6nm], 20% dispersion-liquid pH9.5 silica sol) 2 weight section, and the nonionic surface active agent (polyoxyethylene nonylphenyl ether) 15 weight section. .

[0051] Then, the stenter was supplied and it extended 3.9 times in the longitudinal direction at 120 degrees C. Heat setting of the obtained biaxial oriented film was carried out for 5 seconds at the temperature of 200 degrees C, and the biaxial orientation polyester film of 38-micrometer thickness was obtained.

[0052] The addition of lubricant is shown in the configuration of the final bed depth except the spreading layer of the film created in a table 1, the construction material and mean particle diameter of the lubricant added on each class, and a pan. And the assessment result of the sample extracted from near the full center of the film obtained in this way is shown in a table 2. Any property was good as the result of a table 2 showed.

[0053]

[Examples 2-4, the examples 1-4 of a comparison] According to the example 1, the polyester film which consists of polyethylene terephthalate was created. However, in each example and the example of a comparison, as shown in a table 1, the configuration of a bed depth and the conditions of lubricant addition are changed. In this way, the property of the obtained film is shown in a table 2. In addition, the example 1 of a comparison was extracted from the part of a film full edge. As for the film of this result to this invention, it is clear to have satisfied demand characteristics.

[0054]

[A table 1]

| | 膜厚み (μm) | | | | 滑 剤 | | | | | | |
|----------|--------------------------|----|----|----|-----------------|----------------|-------------|-------------|------|------|------|
| | A層 | B層 | C層 | 全厚 | 滑剤材質／平均粒径(nm) | | | 滑剤添加量 (重量%) | | | |
| | | | | | a | b | c | A層 | B層 | C層 | |
| 実施例 1 | 5 | 28 | 5 | 38 | シリコーン樹脂 1200 | 炭酸カルシウム 600 | アルミナ 400 | a | 0.01 | 0 | 0.01 |
| | | | | | | | | b | 0.2 | 0.04 | 0.2 |
| | | | | | | | | c | 0.1 | 0.02 | 0.1 |
| 実施例 2 | 5 | 33 | — | 38 | シリコーン樹脂 1200 | 炭酸カルシウム 600 | アルミナ 400 | a | 0.01 | 0 | — |
| | | | | | | | | b | 0.2 | 0.08 | — |
| | | | | | | | | c | 0.1 | 0.04 | — |
| 実施例 3 | 5 | 40 | 5 | 50 | シリコーン樹脂 1200 | 炭酸カルシウム 600 | — | a | 0.01 | 0 | 0.01 |
| | | | | | | | | b | 0.2 | 0.04 | 0.2 |
| | | | | | | | | c | — | — | — |
| 実施例 4 | 5 | 15 | 5 | 25 | シリコーン樹脂 1500 | 炭酸カルシウム 600 | アルミナ 400 | a | 0.01 | 0 | 0.01 |
| | | | | | | | | b | 0.2 | 0.04 | 0.2 |
| | | | | | | | | c | 0.1 | 0.02 | 0.1 |
| 比較例 1 | 38 | — | — | 38 | 多孔質シリカ 1700 | — | — | a | 0.07 | — | — |
| | | | | | | | | b | — | — | — |
| | | | | | | | | c | — | — | — |
| 比較例 2 | 38 | — | — | 38 | 炭酸カルシウム 600 | — | — | a | 0.25 | — | — |
| | | | | | | | | b | — | — | — |
| | | | | | | | | c | — | — | — |
| 比較例 3 | 38 | — | — | 38 | シリコーン樹脂 1200 | — | — | a | 0.1 | — | — |
| | | | | | | | | b | — | — | — |
| | | | | | | | | c | — | — | — |
| 比較例 4 | 38 | — | — | 38 | シリコーン樹脂 1200 | 炭酸カルシウム 600 | — | a | 0.01 | — | — |
| | | | | | | | | b | 0.2 | — | — |
| | | | | | | | | c | — | — | — |

[0055]

[A table 2]

| | ヘーズ値 ○：４％以下 ×：４％超 | 配向角 ○：１０度以下 ×：１０度超 | フライスペック ○：５個以下 ×：６個以上 |
|-------|-------------------------|--------------------------|-----------------------------|
| 実施例 1 | ○ | ○ | ○ |
| 実施例 2 | ○ | ○ | ○ |
| 実施例 3 | ○ | ○ | ○ |
| 実施例 4 | ○ | ○ | ○ |
| 比較例 1 | ○ | × | × |
| 比較例 2 | × | ○ | ○ |
| 比較例 3 | × | ○ | ○ |
| 比較例 4 | × | ○ | ○ |

[0056]

[Effect of the Invention] According to this invention, the ***** form film with which are simultaneously satisfied of workability, such as a small orientation angle, high transparency, winding, lamination, inspection, exfoliation, and conveyance, can be offered, and the industrial value is high.

[Translation done.]

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] Polyester film for ***** forms with which it is the co-extrusion film which consists of more than two-layer at least, and the haze value of a film is characterized by an orientation angle being [a milling cutter peck with 10 or less degrees and a major axis of 90 micrometers or more] five or less per two 0.3m 4% or less.

[Claim 2] Polyester film for ***** forms according to claim 1 with which center line surface roughness Ra is characterized by 20nm or more 60nm or less and the ten-point average surface roughness Rz being 500nm or more.

[Claim 3] Polyester film for ***** forms according to claim 1 or 2 with which thickness of a film is characterized by 15-micrometer or more being 75 micrometers or less.

[Claim 4] Polyester film for ***** forms according to claim 1 to 3 characterized by containing at least two or more sorts of lubricant particles from which mean particle diameter differs.

[Claim 5] Polyester film for ***** forms according to claim 1 to 4 characterized by having the spreading layer of easy adhesiveness to silicone.

[Translation done.]